

REMARKS

Claims 38-40 and 43-45 are pending in this application. Claims 38-40 are rejected, and claims 21-37 and 41-42 are withdrawn from consideration. By this Amendment, claims 21-37 and 41-42 are canceled and claims 43-45 are added. In view of the amendments and the following remarks, reconsideration and allowance are respectfully requested.

I. Claim rejection under §112, first paragraph

The Office Action rejects claims 39 and 40 under 35 U.S.C. §112, first paragraph. The Office Action alleges that claims 39 and 40 fail to comply with the written description and enablement requirements. Applicant respectfully traverses the rejection.

The specification discloses an etchant of a semiconductor material with reduced concentrations of metallic elements. The etchant is prepared by immersing stainless steel in an alkali aqueous solution for not less than 10 hours (paragraph 0008). The specification further discloses that the concentration of metal ions can be further reduced by including a strong reducing agent with a very low oxidation potential (paragraphs 0014-0015). The specification discloses that the concentration of heavy metal ions can be further reduced by the addition of silicon to the etchant solution (paragraph 0017). As a result of a strong reducing agent and silicon, an etchant in which a concentration of a heavy metal ion is not more than 3×10^{-6} % and in which any one of concentrations of iron, copper, nickel and chromium ions is not more than 5×10^{-7} % is produced (paragraphs 0015 and 0017).

The specification then describes an etching method carried out by using the described etchant (paragraph 0022). Thus the specification discloses and enables the etching method of claims 39 and 40. The specification provides sufficient guidance to enable one of ordinary skill in the art to practice the claimed method.

Accordingly, Applicant respectfully requests reconsideration and withdrawal of the rejection.

II. Claim rejection under §103

The Office Action rejects claims 38-40 under 35 U.S.C. §103(a) over U.S. Patent No. 4,748,368 to Thompson ("Thompson"). Applicant respectfully traverses the rejection.

Thompson describes a method for etching silicon wafers that includes using an etching solution consisting essentially of KOH and water in a stainless steel vessel (col. 1, lines 40-44). The Office Action acknowledges that Thompson does not disclose an etching solution prepared by immersing stainless steel in an alkali aqueous solution for not less than 10 hours as claimed. However, the Office Action concludes that one of ordinary skill in the art would have been led to the recited 10 hour duration through routine experimentation.

Applicant respectfully disagrees with this conclusion.

First, Thompson does not teach or suggest anything concerning metal contamination. Thompson does not recognize the problem of potential metal contamination from a steel vessel. Thompson does address the problems of silicate contamination from Pyrex containers, but does not address problems with metal contamination. A reference that does not recognize a problem cannot teach the solution.

Second, Thompson's teachings are limited to determining the optimal KOH and isopropyl alcohol concentrations for maximum etch rate and maximum etch quality. In Thompson, the etch quality is visually determined by inspecting the surface characteristics of the etched surface including pits, hillocks and faceting of the silicon surface (col. 2, lines 42-51, Fig. 2). Thompson describes further experimentation involving temperature. However, Thompson does not disclose or suggest anything about immersing a silicon wafer for not less than 10 hours as claimed. Moreover, Thompson ultimately prefers an etching solution composition that maximizes etch rate while maintaining etch quality. The period of time is determined by the known etch rate and the desired etch depth (col. 3, lines 11-16). For at least these reasons, Thompson does not teach or suggest and would not have rendered

obvious an etching method that uses an etchant prepared by immersing stainless steel in an alkali aqueous solution for not less than 10 hours as claimed.

The Office Action also states that the results recited in claims 39 and 40 are inherent in an etch having the duration of not less than 10 hours. Claims 39 and 40 are directed to methods for etching a semiconductor silicon wafer by using an alkali solution including extremely small levels of metal ions. As disclosed in the specification, the solution is obtained by including a strong reducing agent with a very low oxidation potential (paragraph 0015). Furthermore, the etchant solution is obtained by dissolving silicon in the stainless steel immersed solution (paragraph 0017). Finally, from the combination of strong reducing agent with a low oxidation potential and the dissolution of silicon, an etchant in which any one of the concentrations of iron, copper, nickel and chromium ions is not more than 5×10^{-7} % is obtained (paragraph 0017).

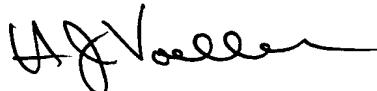
The alkali etchant solution that includes extremely small amounts of metal ions is not taught or suggested by Thompson. Therefore, an etching method that uses such an alkali solution can not have been taught or suggested. Accordingly, Thompson does not teach or suggest and would not have rendered obvious the methods of claims 38-40. Applicant respectfully requests reconsideration and withdrawal of the rejection.

III. Conclusion

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 38-40 and 43-45 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,



William P. Berridge
Registration No. 30,024

H. James Voeller
Registration No. 48,015

WPB:HJV/rle

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OLIFF & BERRIDGE, PLC
P.O. Box 19928
Alexandria, Virginia 22320
Telephone: (703) 836-6400

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